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Data Evaluation Report on the Chronic Toxicity of DPX-14740 (Diuron) to
Freshwater Invertebrates - *Daphnia magna*
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MEMORANDUM

SUBJECT: Data Evaluation Report on the Chronic Toxicity of DPX-14740 (Diuron) to
Freshwater Invertebrates - *Daphnia magna*

FROM: Richard M. Lee, Biologist *Richard Lee 4/1/08*
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The Environmental Fate Effects Division (EFED) has completed a review of a 21-day chronic toxicity study of Diuron to freshwater invertebrates - *Daphnia magna*: study was submitted under DP Barcode D338678.

The following is a brief summary of the submitted study:

CITATION:

Samel, Alan. 2006. Diuron (DPX-14740) Technical: 21-Day Chronic, Static-Renewal Toxicity Test to *Daphnia magna*. Unpublished study performed by E.I. du Pont de Nemours and Company, HaskellSM Laboratory for Health and Environmental Sciences, Newark, Delaware. Laboratory report number DuPont 20776. Study sponsored by E.I. du Pont de Nemours and Company, Wilmington, Delaware. Study completed November 22, 2006.

EXECUTIVE SUMMARY:

The 21-day-chronic toxicity test of DPX-14740 (Diuron) to *Daphnia* (*Daphnia magna*) was studied under static-renewal conditions. Daphnids were exposed to corrected nominal concentrations of 0, 0.0595, 0.119, 0.238, 0.446, 0.892, and 1.78 mg ai/L, respectively. The mean-measured concentrations were <0.001 (<LOQ; negative control), 0.0572, 0.113, 0.229,



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0.432, 0.865 and 1.73 mg ai/L. The 21-day LC_{50}/EC_{50} based on mortality was 1.07 mg ai/L. The 21-day NOAEC based on length which was the most sensitive endpoint, was 0.0572 mg ai/L. The sub-lethal effects that were measured, included reductions in live young produced, inhibited growth (as length and dry weight), lethargy, pale in color and floating at the surface. Production of offspring in the treated groups indicated that DPX-14740 (Diuron) had an effect on the reproduction at concentrations greater than 0.229 mg ai/L. The most sensitive endpoint was length.

This study is classified as scientifically sound and it satisfied the guideline requirements for a chronic toxicity study with freshwater invertebrates.

RESULT SYNDROM

Test Organism Age (eg. 1st instar): Neonates (<24 Hours)
Test Type (Flow-through, Static, Static Renewal): Static-Renewal

Adult Survival:

LC_{50} : 1.07 mg ai/L 95% C.I.: 0.844-1.44 mg ai/L
Probit Slope: N/A 95% C.I.: N/A
NOAEC: 0.432 mg ai/L
LOAEC: 0.865 mg ai/L

Live Young Produced:

NOAEC: 0.229 mg ai/L
LOEAC: 0.432 mg ai/L

Length:

NOAEC: 0.0572 mg ai/L
LOAEC: 0.113 mg ai/L

Dry Weight:

NOAEC: 0.432 mg ai/L
LOAEC: 0.865 mg ai/L

Endpoint(s) Affected: Adult Survival, Live Young Produced and Growth (Length and DryWeight)

REPORTED STATISTICS:

The NOAEC value for survival (Day 21) of adult Daphnids was determined using the

Cochran-Armitage trend test, used in a step-down manner with equally-spaced concentration scores. The EC_{50} value was determined via probit analysis. As complete mortality was observed in the highest treatment level, it was excluded from all further analyses, making the 0.865 mg ai/L the highest treatment concentration.

The total number of live young was analyzed using Dunn's test due to non-normality and the absence of any normalizing transformations. The Mann-Whitney test was used to determine the NOAEC value for the number of immobile daphnids. Massive ties were present requiring the use of exact permutation methods. The Mann-Whitney test was better suited for this data than the Jonckheere test due to the constant response in all groups but 1.73 mg ai/L.

Massive ties were present in the data reporting length and dry weight of surviving adult daphnids and consequently, exact permutation data analysis methods were used for analysis. The NOAEC values for growth parameters (length and dry weight) were determined by the step-down exact Jonckheere-Terpstra test.

VERIFICATION OF STATISTICAL RESULTS:

Statistical Method(s): The reviewer analyzed adult percent survival, number of live young produced, length and dry weight for significant differences relative to the negative control. The NOAEC value for adult percent survival was determined using Fisher's Exact Test. Prior to determining the NOAEC and LOAEC values for all other endpoints, the reviewer tested each data set for normality using the Chi-square and Shapiro-Wilks tests and for homogeneity of variance the Hartley and Bartlett's tests were used. If these assumptions of ANOVA were met, the reviewer determined the NOAEC and LOAEC values using the parametric Dunnett's test (equal reps) or Bonferroni's (unequal reps) test and the Williams test. If the assumptions were not met, the reviewer determined the NOAEC and LOAEC values using the non-parametric Steels Many-One Rank Test, Wilcoxon Rank Sum test (with Bonferroni adjustment) or the Kruskal-Wallis test. All NOAEC and LOAEC values were determined using Toxstat Statistical Software. The LC_{50} value was determined using the binomial probability method via Toxanal Statistical software. The mean-measured concentrations were used in all analyses.

Adult Survival:

LC_{50} : 1.08 mg ai/L 95% C.I.: 0.432-1.73 mg ai/L

Probit Slope: N/A 95% C.I.: N/A

NOAEC: 0.432 mg ai/L

LOAEC: 0.865 mg ai/L

Live Young Produced:

NOAEC: 0.229 mg ai/L

LOEAC: 0.432 mg ai/L

Length:

NOAEC: 0.0572 mg ai/L

LOAEC: 0.113 mg ai/L

Dry Weight:

NOAEC: 0.432 mg ai/L

LOAEC: 0.865 mg ai/L

STUDY DEFICIENCIES:

There were no study deficiencies.

REVIEWER'S COMMENTS:

EPA's LC₅₀ value for adult survival agreed with the study author's; however, the reviewer's NOAEC value was more conservative. EPA's analysis of adult survival yielded the same NOAEC value as the study author (0.865 mg ai/L), but EPA thought that the 20% immobility at this level was biologically significant. Additionally, EPA's NOAEC values for live young produced and body length were more conservative than those of the study author. EPA's NOAEC values are reported in the Executive Summary and Conclusions sections of this DER. The EPA and study author yielded similar results for dry weight.

The samples taken for analytical verification on Day 0 were centrifuged to verify that there was no significant effect on the measured concentration due to binding of the test material to the daphnid diet. These values were not included in the calculation of the mean-measured concentrations. Samples were only taken on Days 0 and 2 at the highest treatment level due to complete mortality by Day 3.

The results from periodic screening analysis of the dilution water indicated the presence of the following elements: calcium (32.5 mg/L), chloride (63.6 mg/L), copper (0.0244 mg/L), magnesium (2.75 mg/L), manganese (0.0169 mg/L), potassium (3.06 mg/L), sodium (6.68 mg/L) and sulfate (8.6 mg/L).

The physiochemical properties of the test material were not included in the study report.

The study was completed on November 22, 2006.

CONCLUSIONS: The study is scientifically sound and acceptable. The NOAEC and LOAEC values based on body length, the most sensitive endpoints, were 0.0572 and 0.113

mg ai/L, respectively.

Adult Survival:

LC₅₀: 1.07 mg ai/L 95% C.I.: 0.844-1.44 mg ai/L

Probit Slope: N/A 95% C.I.: N/A

NOAEC: 0.432 mg ai/L

LOAEC: 0.865 mg ai/L

Live Young Produced:

NOAEC: 0.229 mg ai/L

LOEAC: 0.432 mg ai/L

Length:

NOAEC: 0.0572 mg ai/L

LOAEC: 0.113 mg ai/L

Dry Weight:

NOAEC: 0.432 mg ai/L

LOAEC: 0.865 mg ai/L Endpoint(s) Affected: Adult Survival, Live Young Produced and Growth (Length and Dry Weight)